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DRAWINGS ATTACHED

1 278 362

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(54) IMPROVEMENTS IN AND RELATING TO ELECTRIC MOTORS

(71) We, TOKYO KAGAKU KABUSHIKI KAISHA, of No. 14-11, Tateishi 3-chome, Katsushika-ku, Tokyo, Japan, a Japanese Body Corporate, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an electric motor, and more particularly to a small-sized electric motor which can suitably be used as the prime mover for toys and which does not need to have a large torque and a strong construction, or for teaching the principle of a motor.

The need for a small-sized electric motor which is more simple in structure and can be produced at low cost is increasing more and more since the severe competition in the electric toy field tends to force the toy manufactures to lower the cost of the production of the toys. Nevertheless, the electric motors heretofore proposed for such purpose have not been satisfactory in the simplicity of their structures and the manufacturing cost.

It is, therefore, an object of this invention to provide an electric motor which is simple in structure, especially in the structure of a support means for supporting wire brushes which supply driving current to a rotor through a commutator, thereby enabling the manufacturing cost of the motor to be reduced.

It is another object of this invention to provide an electric motor which can be readily assembled, thereby enabling the mass-production of the motor to be facilitated.

According to the present invention there is provided an electric motor which comprises a metallic casing having a cylindrical inner wall and an end opening; a permanent magnet of an arcuate shape attached to said cylindrical inner wall of the casing; a rotor inserted in the casing and having a rotary shaft therethrough and a winding thereon, said rotary shaft having near one end a commutator and being supported by a pair of bearings which are respectively provided in an end wall of said casing and in a closure member made of an insulating material and fitted to said end opening of the casing; a support means provided in the inner surface of the closure member and supporting two wire brushes which contact near their respective one end portions segment surfaces of the commutator, said two wire brushes having at their respective intermediate portions ring portions which both are mounted on said support means and are insulated from each other; one terminal provided in the surface of the closure member and electrically connected to one of said two wire brushes; and a conducting means mounted on said support means electrically connecting the other wire brush to the casing thereby to make the casing the other terminal of the motor.

An embodiment of the invention will now be described with reference to the accompanying drawings in which:

Fig. 1 is a front view of an electric motor according to this invention with a closure member removed;

Fig. 2 is a longitudinal cross sectional view of the electric motor shown in Fig. 1;

Fig. 3 is a partly cut-away perspective view of the electric motor shown in Fig. 1, in a vertical position and showing the internal structure of the motor; and

Fig. 4 illustrates a manner in which the electric motor according to this invention is secured to a device.

Referring to Figs. 1, 2 and 3, a cylindrical casing 1 made of a thin metal sheet includes a closed end wall 1*a* in which a bearing 2 is provided, an opening 1*b* to which an insulating closure member 3 is fitted, and a cylindrical inner wall 1*c*. To the cylindrical

inner wall 1c is fixedly attached an arcuate permanent magnet 4.

A rotor 5 includes a core 5a, a commutator 5b, and a shaft 5c. Coils 5d are wound on the core 5a, and two segments 5e and 5f are arranged in opposed relation on the circumferential surface of the shaft to form the commutator 5b.

As seen from Fig. 1, the shaft 5c of the rotor 5 is rotatably disposed in the casing 1 so that the rotor 5 can rotate within a space defined by the inner surface of the permanent magnet 4 and the inner wall of the casing 1.

The closure member 3 has a hole 3a serving as a bearing for one end of the shaft 5c, and small holes 3b, 3c. The closure member 3 has also an insulating projection 3d projecting from the inner surface thereof. The insulating projection 3d may advantageously be formed integrally with the closure member 3 from an insulating material such as plastics. One end of the shaft 5c is fitted into the hole 3a, which is then covered by a cap member 6 having a pair of legs 6a, 6b. The tip ends of the legs 6a, 6b of the cap member 6 are bent and inserted into the smal holes 3b, 3c, respectively to secure the cap member 6 onto the outer side of the closure member 3.

Mounted on the insulating projection 3d projecting inwardly from the cover member 3 are ring portions 7a, 8a of the two resilient wire brushes 7 and 8, with an insulating washer 9 interposed between the ring portions 7a and 8a to electrically insulate them from each other. To the top portion of the projection 3d is secured a bracket 10 having two lugs 10a, 10b.

At the rotor 5 rotates, one end of the wire brush 7 is brought alternately into contact with the segments 5e, 5f of the commutator. The other end of the wire brush 7 engages the tip portion of the leg 6a projecting from the small hole 3b of the closure member 3. Thus, the cap member serves as one terminal of the motor. Similarly, one end of the wire brush 8 is brought alternately into contact with the segments 5f, 5e as the rotor 5 rotates. The other end of the brush 8 engages the tip portion of the lug 10a of the bracket 10. The other lug 10b of the bracket 10 is inserted into a cut-out portion 3e of the periphery of the closure member 3, which is then securely held therein by pressing it by the periphery of the opening 1b of the casing 1 when the closure member 3 is fitted into the opening of the casing 1. Thus, the casing 1 serves as the other terminal of the motor.

In operation, when A.C. voltage is applied between the cap member 6 and the casing 1, A.C. current flows from the leg 6a of the cap member 6 through the wire brush 7, the segmem 5e of the commutator 5b, the coils 5d of the rotor 5, the segment 5f of the commutator, the wire brush 8, the lug 10a of the bracket 10 and the lug 10b of the bracket 10 to the casing 1, or in the opposite direction, alternately. Thus, A.C. magnetic flux is produced, which cooperates with magnetic flux of the permanet magnet 4 to provide a starting torque to the rotor 5 to rotate the same.

Fig. 4 illustrates an example wherein a small-sized electric motor thus formed is used as a prime mover for a toy. In Fig. 4, the rotary shaft 5c of the motor is extended through a hole 11a of a frame 11 and connected to a drive mechanism of the toy. The casing 1 is resiliently supported by means of a spring plate 11b and the cap member 6 mounted on the closure member 3 is brought into contact with a spring plate 11c. An A.C. source is connected between both the spring plates 11b and 11c. Thus, the electric motor can readily be electrically connected to the A.C. source through the supporting spring plates 11b and 11c, without a soldering operation.

WHAT WE CLAIM IS:—

1. An electric motor which comprises a metallic casing having a cylindrical inner wall and an end opening; a permanent magnet of an arcuate shape attached to said cylindrical inner wall of the casing; a rotor inserted in the casing and having a rotary shaft therethrough and a winding thereon, said rotary shaft having near one end a commutator and being supported by a pair of bearings which are respectively provided in an end wall of said casing and in a closure member made of an insulating material and fitted to said end opening of the casing; a support means provided in the inner surface of the closure member and supporting two wire brushes which contact near their respective one end portions segment surfaces of the commutator, said two wire brushes having at their respective intermediate portions ring portions which both are mounted on said support means and are insulated from each other; one terminal provided in the surface of the closure member and electrically connected one of said two wire brushes; and a conducting means mounted on said support means electrically connecting the other wire brush to the casing thereby to make the casing the other terminal of the motor.

2. An electric motor as claimed in Claim 1, wherein said support means comprises an insulating projection projecting from the inner surface of the closure member, the respective ring portions of the two wire brushes mounted on the insulating projection being insulated from each other by

means of an insulating washer provided therebetween.

3. An electric motor as claimed in Claim 1 or 2, wherein said one terminal comprises a cap member fitted over the bearing in the closure member and having a pair of legs which both have at their respective ends bent portions which are inserted in holes provided in the closure member, one of the two wire brushes being engaged at its other end with one of said bent portions of the legs thereby to make an electrical connection therebetween.

4. An electric motor as claimed in Claim 1, 2 or 3, wherein said conducting means mounted on said support means comprises a metallic bracket having two lugs one of which is securely inserted between the casing and the closure member and the other of which engages the other of the two wire brushes at its other end, thereby making an electrical contact between the other of the two wire brushes and the casing.

5. An electric motor as claimed in Claim 2, 3 or 4, wherein said insulating projection is formed integrally with said closure member.

6. An electric motor substantially as hereinbefore described with reference to the accompanying drawings.

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1278362 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

Fig. 1

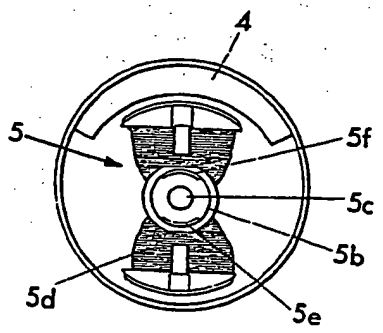


Fig. 2

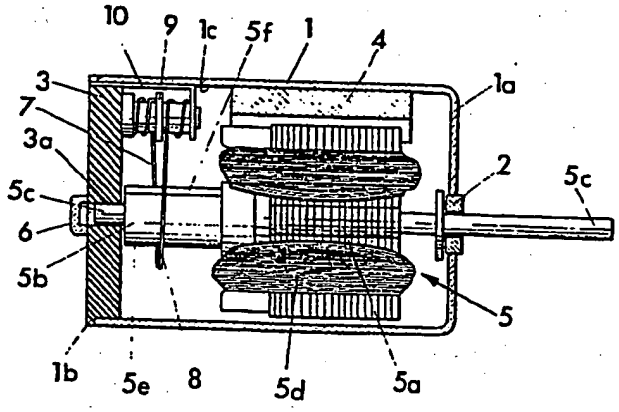
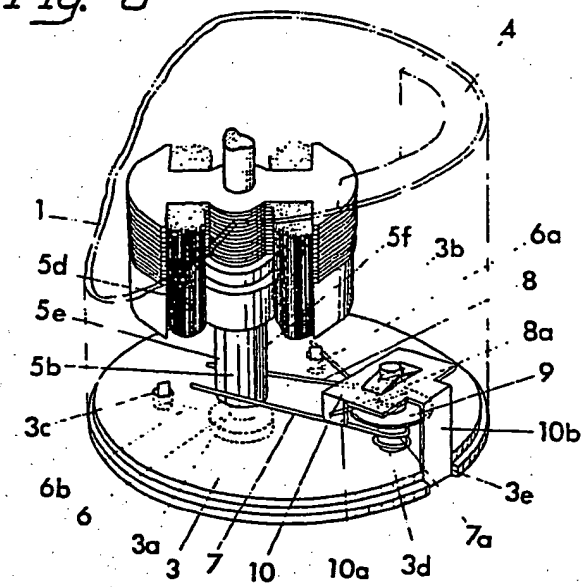


Fig. 3


A
1
5d
5e
5b
3c
6b
6
3a
3
7
10
10a
3d
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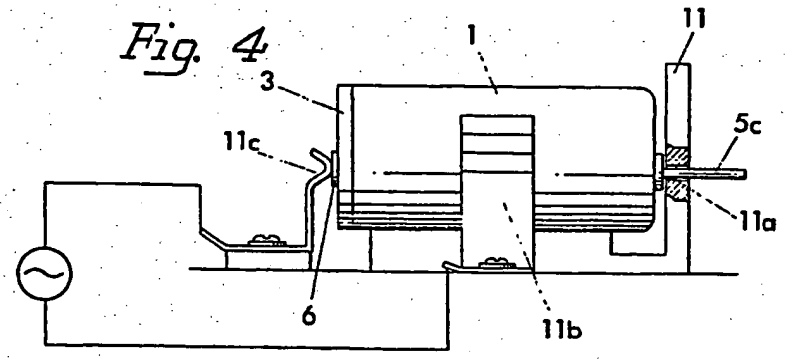
8a
8
6a
3b
5f

Fig. 4


1
11
3
11c
5c
11a
6
11b